

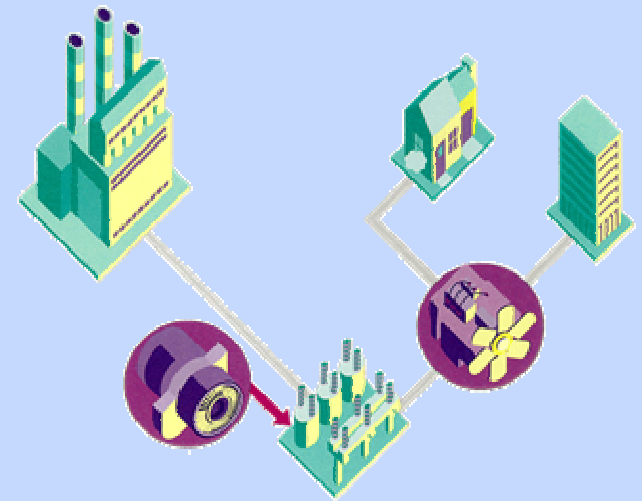
# *Distributed Energy Resources*

## *The Power to Choose*

# Gas Technology Institute

John F. Kelly, Director DER

November, 2001



# GTI DE Division Mission

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- **Produce a Sustainable Urban Environment through DER Technology Deployment**
  - Lower Energy Costs
  - Improve Air Quality
  - Increase Energy Efficiency
  - Increase Fuel Diversity/Stabilize Supply
- **Clients**
  - Department of Energy
  - States
  - Cities
  - Foundations
  - Gas/Energy Industry



# Strategic Initiatives

## Applications Development

- SWGR, Controls and Monitoring
- Plug and Play Integrated Systems
- Prime Movers (Fuel Cells, Engines, Turbines)

## Market Transformation

- DOE Regional Initiatives
- DE, Cooling, and National Accounts Alliance

## Technology Optimization

- Distributed Energy Technology Center
- Prime Movers and CHP Systems

## DE Programs

- Regional Energy Planning
- Bio-Mass

## Automated Tools

- Building Analyzer (EE, CHP, DSM)
- Gas Cooling Guide

# Completed Programs



CAT 3500



# Current Projects

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- DOE Waukesha/Trane BCHP System
- DOE/Capstone/Thermax/Broad BCHP Systems
- DOE Chicago Museum of Science and Industry BCHP System
- DOE/Chicago Industrial DE Plan
- DOE PEM Fuel Cell Development
- DOE Animal Waste to Energy System
- DOE Wood Gasification System
- Gas Industry MicroTurbine Development and Assessment Program
- CEC Solid Oxide Development SOFC
- CEC Partial Oxidation Turbine

# What's Next? – Technology Development

**Prime Movers**

**Thermally  
Activated  
Technologies**

**Systems  
Development**

**Grid Reliability**

**Programs**

## ■ Minimize Risk

- Financial forces - investors
- Market forces - demand and emissions
- Third party assessment and verification

## ■ GTI \$4,000,000 DETC

- Advanced Labs
- Power Generation Expertise
- Partnership with Manufacturers
  - Assist manufacturers with identifying and resolving issues before field deployment

# What's Next? – National Leadership

**Prime Movers**

**Thermally  
Activated  
Technologies**

**Systems  
Development**

**Grid Reliability**

**Programs**

## ■ **Divide and Concur**

- **IDEA, AGCC, USCHPA, DPCA, etc.....**
- **Microturbines vs. Engines**
- **Renewables vs. Natural Gas**

## ■ **DER Leadership Team – 47 GW**

- **Steering Committee to Oversee and Refine Implementation of DOE Roadmap**
- **10 to 15 Stakeholders**
  - **Future at stake**
- **Think nationally act locally**
  - **CADER**
  - **MW CHP Initiative**
  - **NE CHP Initiative**

# What's Next? – Metro Energy Plans

**Prime Movers**

**Thermally  
Activated  
Technologies**

**Systems  
Development**

**Grid Reliability**

**Programs**

- **Lack of Regional DE Energy Plans**
  - No commitment
  - No programs
  - No direction/influence
- **Chicago Regional Energy Plan**
  - **6 Billion kWh ~ Projected 10 yr growth**
    - Energy Management (EE and DSM)
    - Distributed Generation
    - CHP
    - Renewables
  - **Ten Year Implementation Plan**
    - Policy
    - Programs

# Chicago Metro Energy Plan Implementation

Committed to 3,000 Million kWh from DE

<u>Area</u>	<u>Program</u>	<u>Million kWh</u>	<u>MW</u>
Renw.	Waste to Energy	160	20
DG	Water Pumping	60	60
DG	Building DG	600	200
Cogen	Industrial	300	100
Cogen	University/Hospital	<u>600</u>	<u>200</u>
Total		1,720	580

# What's Next? – DER Technical Issues

**Prime Movers**

**Thermally  
Activated  
Technologies**

**Systems  
Development**

**Grid Reliability**

**Programs**

## ■ (Mis) Information Shapes Policy

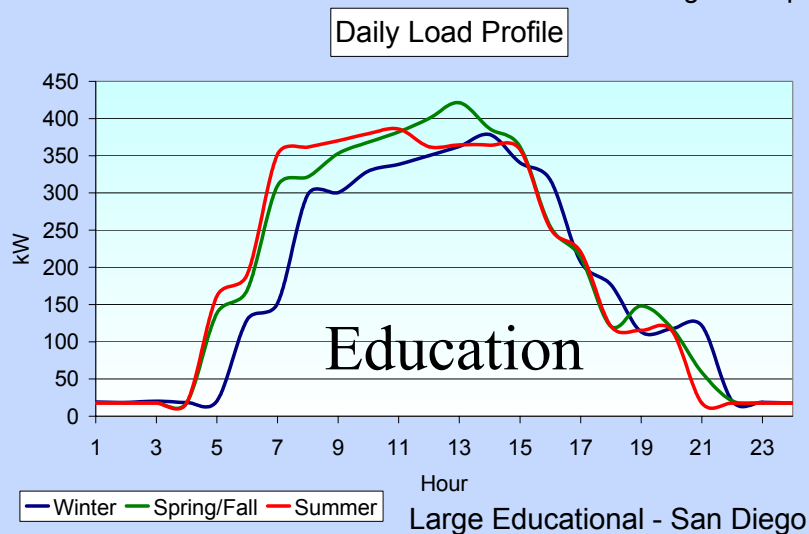
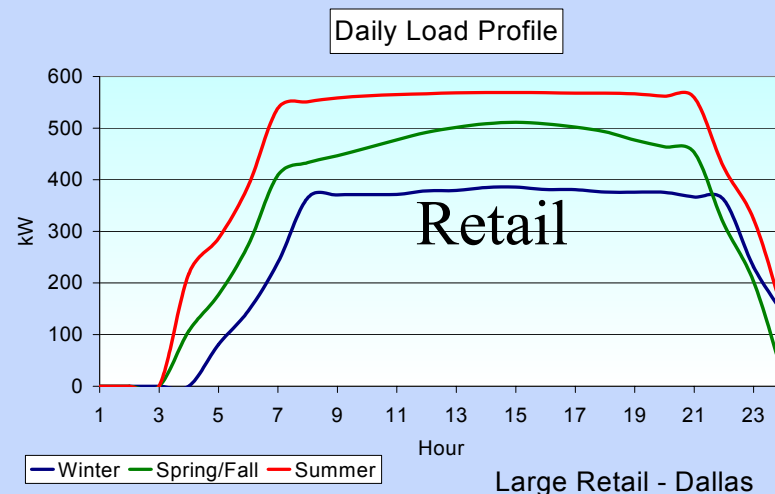
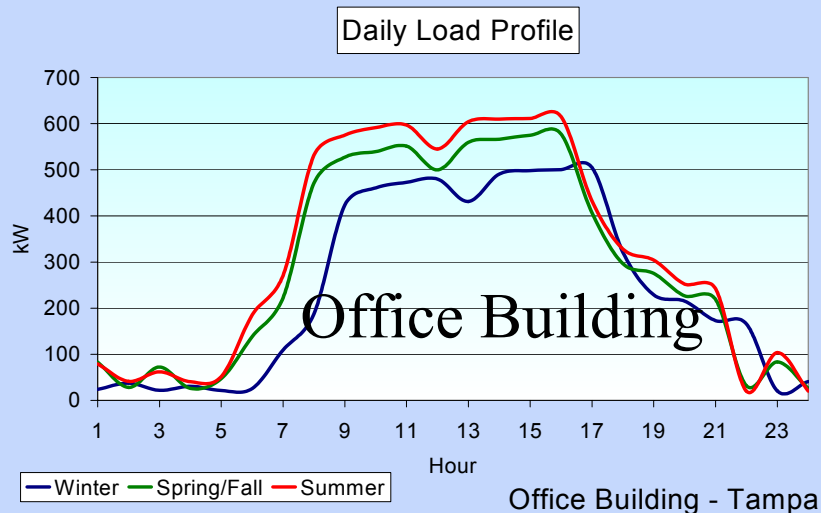
- Electricity Pricing and Tariffs Designed to reduce DER economics
- Emissions Standards (0.4 lbs/MWh?) Eliminate Customer Choice
- DER will increase electricity prices
  - Reduce kWh through grid
- Too much DE may de-stabilize grid

## ■ GTI Funding Research

- Electricity Pricing – Impact of DER
- Power Generation Emissions – Impact of DER
- BACT for DER

# DER Impact on Grid, ~ 90 GW Large Commercial

- Displace ~ 20% of power consumption growth, 1500 bkWh



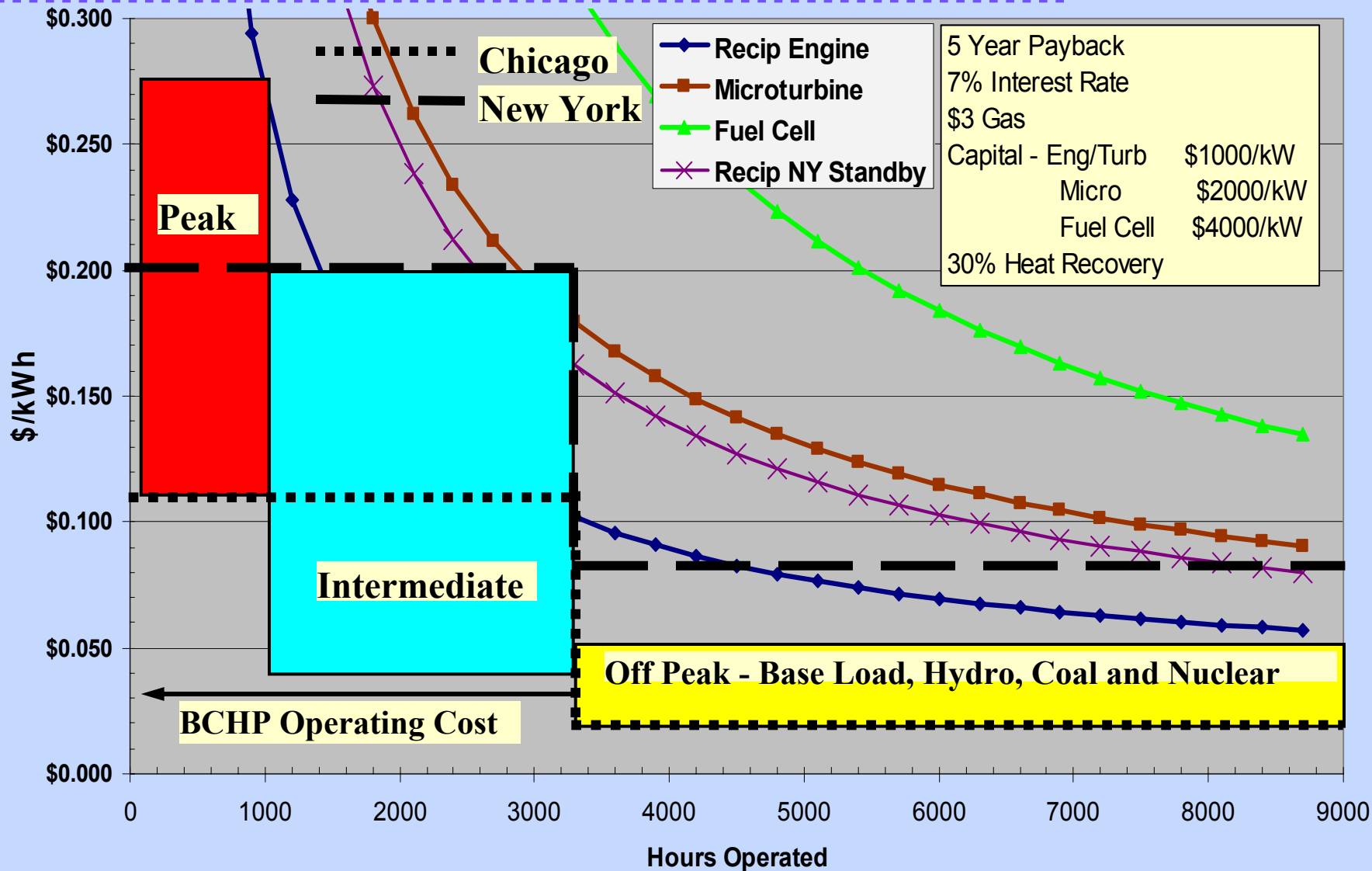
Type	#	Billion kWh
Office	40,000	72
Retail	30,000	50
Education	90,000	150
Total Potential =		272

# DER BACT?

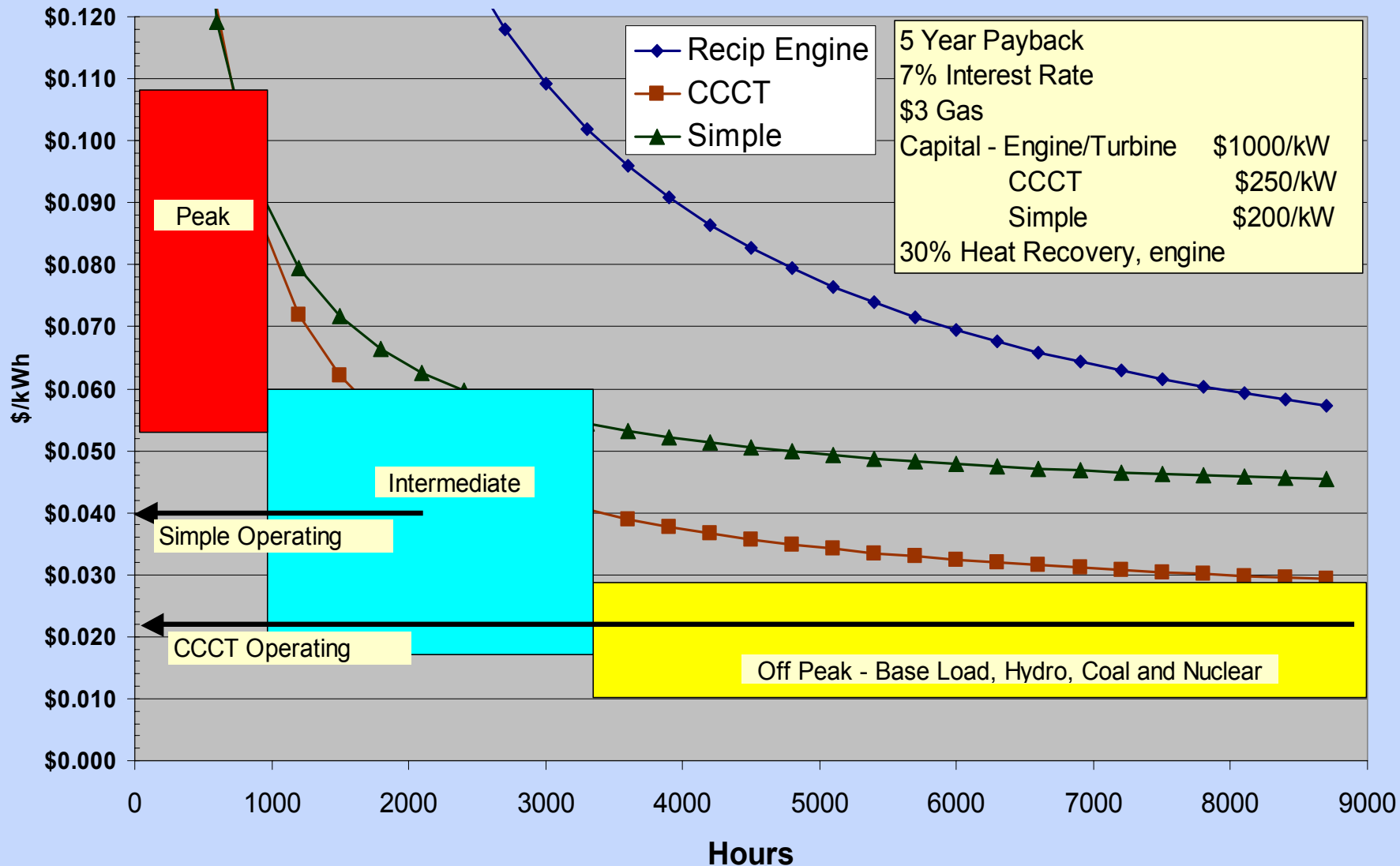
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- **BACT Standards and Criteria**
  - Sufficient Capacity to impact market
  - Proven reliability
  - Economically viable
  - Similar scale and market – water heater vs. industrial boiler?
- **Applied to DER**
  - Lean Burn Reciprocating Engines Set BACT
  - CCCT/Simple Cycle Turbines not same scale or market

# DER Economics vs. Grid - BACT Impact



# DER vs Central, BACT Impact

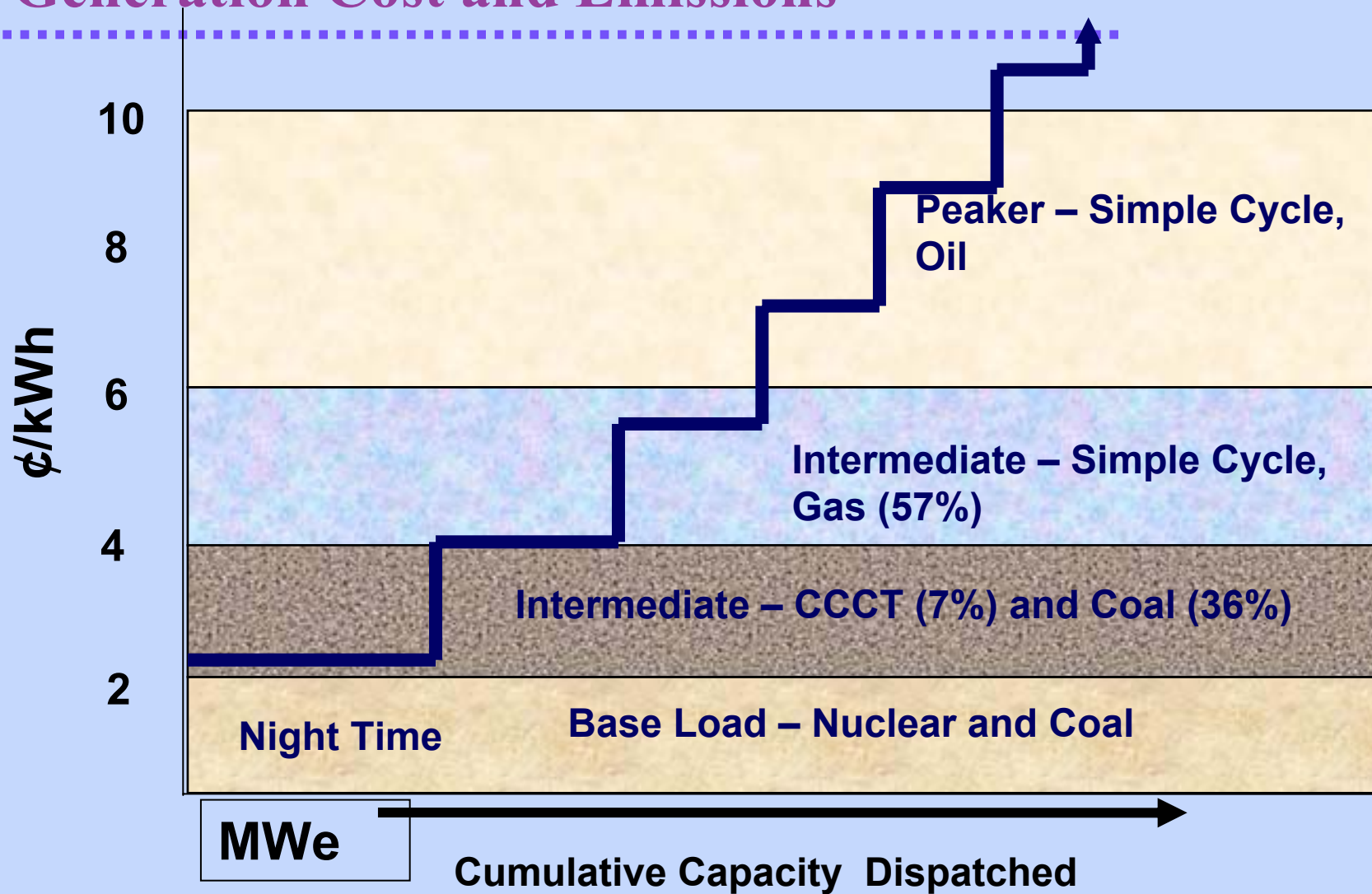


# State Emissions Standards

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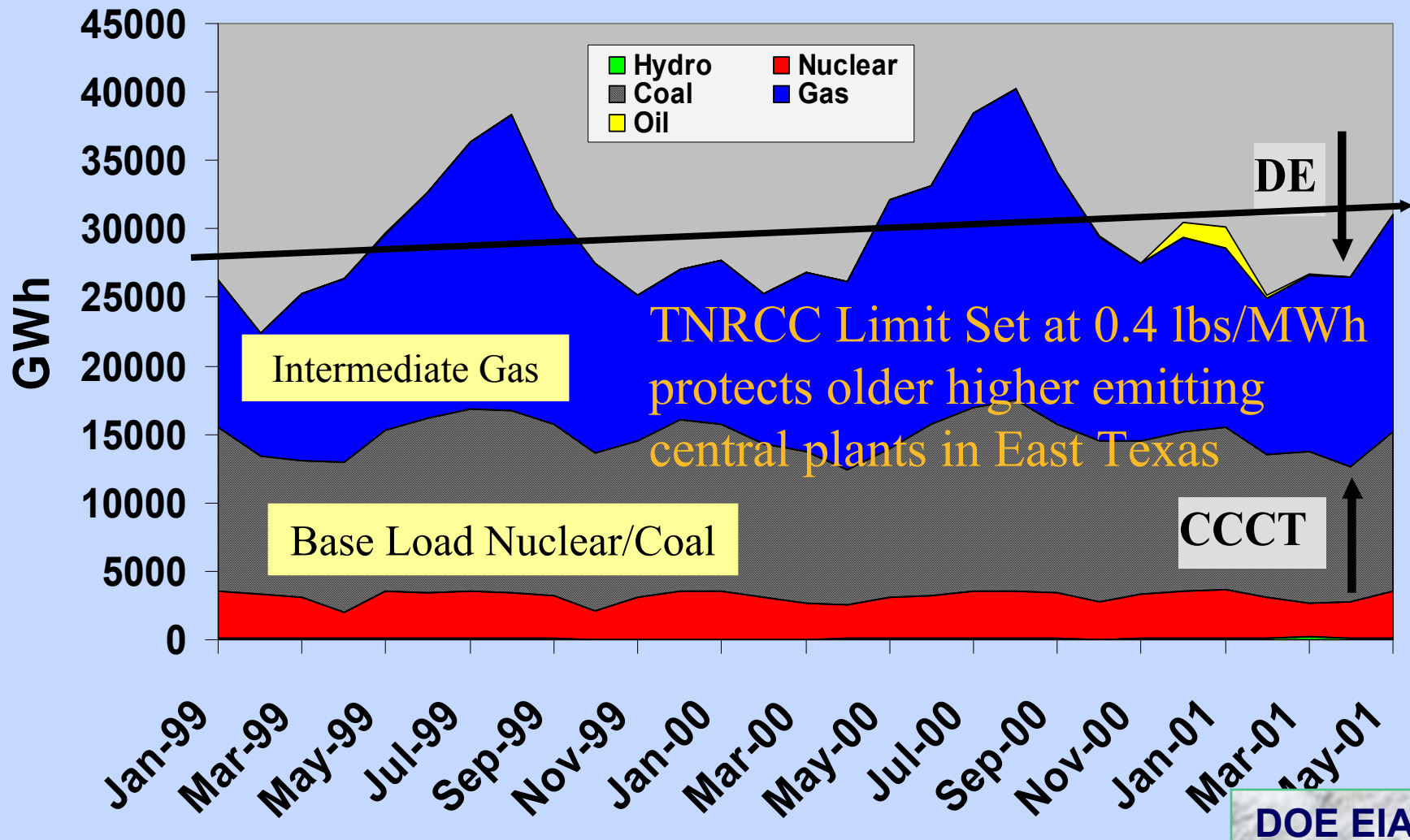
- **East Texas Rules may Increase Emissions**
- **Further Analysis is Required in New York**
  - **Develop Criteria for determining BACT**
  - **Differentiate Supply**
    - Peak - <1000 hours
    - Intermediate ~ 3000 hours
    - Base >4000 hours
  - **Think in Horizons of Time – 7, 14, 21 years**
    - Sufficient Capacity to impact market
    - Proven reliability
    - Economically viable
    - Similar scale and market – water heater vs. industrial boiler?

# Generation Cost and Emissions

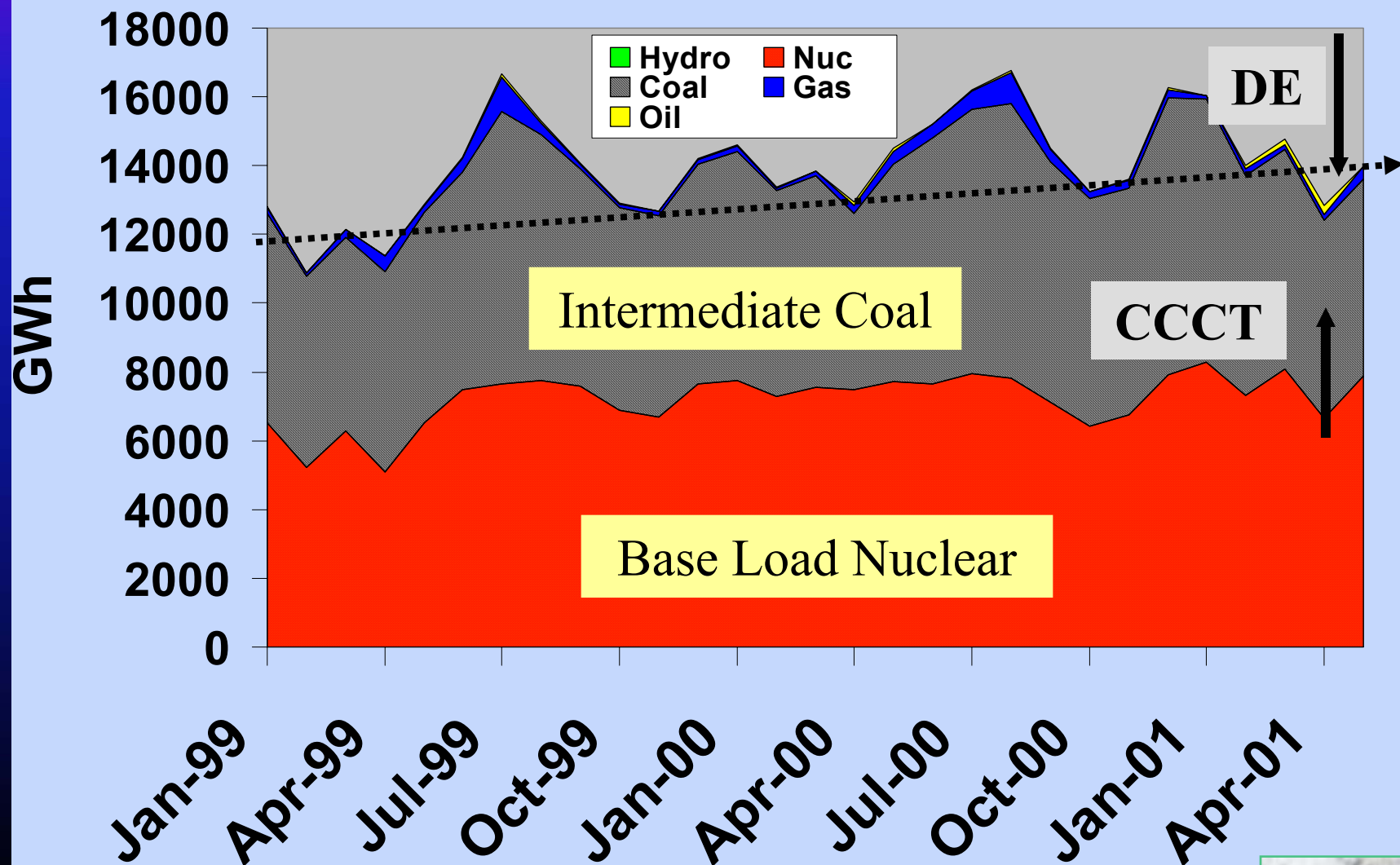


# Texas Generation

23,000–1MW DE Plants needed to displace Gas > 2.5 lbs/MWh



# Illinois Generation



# Summary

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## ■ Continued R&D is needed

- Lower first cost
- Improved emissions
- Improve efficiencies
- Plug and play

## ■ Other Needs

- National Leadership / Regional Implementation
- Technology Development
- Technical Papers - Grounded data for decision makers
- Metro Area Energy Plans
  - Commitments – 6 billion kWh
  - Programs – Industrial, Water, BCHP, etc.....